

## Effect of Clinic Design on Patient Care: Perceptions of Medical Staff and Patients

Charu Srivastava  
*Stanford University*

### Abstract

This research project studies the perceptions of medical staff and patients on the architectural design of outpatient clinics and hospitals. It explores the perceived influence of design on health care delivery. A total of 24 medical staff members and patients participated in surveys and interviews at seven medical sites within the Bay Area, California, and New Delhi, India. Surveys collected information about hospital interior design, layout, and care levels, while interviews further elaborated on participants' emotional responses to design features. Mean scores and combined scores from survey results were calculated and compared. Overall, Bay Area patients are more satisfied than New Delhi patients with design features such as wall décor and lighting, and record the highest levels of care and comfort. Bay Area staff are less satisfied than New Delhi staff with design features, and perceive poor navigation around their workspace as a hindrance to efficient delivery of care. From this study, it can be concluded that patients and staff perceive and value design features differently. Additionally, staff-centric architectural design can improve staff's perceived workflow and ability to provide care, while patient-centric design can enhance patients' perceived treatment experience.

## Purpose

The purpose of this research is to study the perceptions of medical staff and patients regarding the influence of architectural design on staff's work experience and patients' treatment experience. It compares and contrasts design of public and private outpatient clinics and hospitals in the Bay Area, California and New Delhi, India. The study hypothesizes that interior design, layout, and organization of health care facilities can affect the hospital staff's perceived workflow efficiency and ability to provide improved patient care, as well as the patients' perceived level of care and comfort.

## Background

Edward Durrell Stone designed the old Stanford Medical Center in the 1950s, and derived much of his aesthetic for the building from South Asian and Mughal (Islamic) architecture. The Stanford Medical Center includes features such as interior courtyards, columns, arches, covered walkways, concrete grill screens, and floating planters. Despite its dramatic entrance and sense of grandeur, the Stanford Medical Center has several functional problems, such as inaccessibility to the dean's office by road, as well as limited patient care capacity.

Hospital design has been studied only for a few decades, and new findings continue to emerge and impact future design features. Published in 1978, "View Through a Window may Influence Recovery," by Roger Ulrich, is one of the first well-documented research articles on the effect of hospital design on patient outcomes and staff and physician performances. Ulrich found that even simple design features, such as a window overlooking an open space, help patients recover post-surgery. Furthermore, better lighting and ventilation promote positive feelings and restorative benefits, helping patients to heal faster (Ulrich, 1984, p. 421). These design features had a similarly positive effect on hospital staff, making them feel more energetic and enthusiastic about their work and thus leading to greater job satisfaction (Ulrich, 1984, p. 421).

Recent studies also show that views of nature reduce psychological distress and recovery time of the patients, while enhancing staff functioning and job satisfaction (Mroczek, 2005, p. 233). *Image 1* shows a healthcare facility with natural ambient surroundings. "Best Practices: Environmental and Therapeutic Issues in Psychiatric Hospital Design: Toward Best Practices," by Karlin and Zeiss (2006), discusses the Palo Alto VA's award-winning hospital design by The Design Partnership in San Francisco, and its role in the overall recovery process of patients. The healthcare facility serves as a paradigm for effective ambient, architectural and interior design features such as natural light, layout, furnishings, and colors (Karlin & Zeiss, 2006, p. 1376).



IMAGE 1. Views of outdoor landscapes repeatedly emerge as a desirable design feature.

While most past research has focused on the effect of design on patient outcomes, fewer studies have explored the influence of interior design on the functioning of hospital staff and physicians. “Hospital Design and Staff Perceptions: An Exploratory Analysis,” by Mroczek et al. (2005), delves into the ways in which environmental interventions that promote patient-centered design improve the functioning of medical staff. It uses systematic research methods to investigate staff views of their place of work. Mroczek et al. (2005, p. 238) discovered that factors such as increased natural light, live instrumental music in the atrium, airflow, separation of public areas from patient transport areas, water features such as fountains, and home-like patient rooms not only increased comfort for the patients, but also enabled staff to enjoy their work and perform their jobs more effectively. Hospitals with high employee satisfaction were likely to have low turnaround and high physician loyalty. The study concluded that a better-designed hospital catering to the needs of the employees brought in more business, making the hospital more productive. This in turn improved patient outcomes and the quality of the healthcare provided at the facility (Mroczek et al., 2005, p. 237).

While these articles objectively address the effects of design on patient outcomes in large hospitals, they fail to explore the differences in employees’ perceived workflow at smaller outpatient clinics. They are also limited in the selection of locations as all the hospitals are in the United States. This research study attempts to learn more about the influence of location and culture on the design of small and medium-size outpatient clinics in vastly diverse geographical areas. It also seeks to better understand staff and patient perceptions of their experience in healthcare environments through qualitative measures, rather than empirical evidence of treatment outcomes.

## Methodology

This study was conducted over a 10-week period in the summer of 2015. During the first three weeks, four healthcare environments in the Bay Area were observed and evaluated. In the subsequent three weeks, three healthcare environments in New Delhi were similarly studied. The final four weeks consisted of data analysis and interpretation.

*Observational Study:* The healthcare environments in the Bay Area and New Delhi were all outpatient clinics, but varied in size (two small, four medium, and one large). In each healthcare environment, observations were made regarding the objective architectural principles of space, form, threshold, light, materiality, and scale. These notes were supplemented by analyzing the building through the subjective personal lens of sensation, intuition, prior knowledge, and direct experience. This two-pronged approach allowed for a more holistic documentation of the spaces' architectural design. Additionally, observations relating physical design and human interactions with spaces were also recorded. Waiting rooms, hospital corridors, atriums, exam rooms, and doctors' offices all featured as important sites for observation, as they were the most frequented public and private areas within the medical facilities. Significant factors studied in these rooms included utilization of space, internal and external aesthetics, color, materials, flooring, lighting, sign posting, width of corridors, size of waiting rooms, and number and size of windows. These factors were universally found in all facilities and could easily be studied.

*Data Collection:* In each healthcare environment, medical staff and patients were recruited to complete pen and paper surveys and in-person interviews. Survey questions involved rating design features such as lighting, navigation, aesthetics, layout, and participants' feeling of care and comfort. Each feature was rated 1-4 on a Likert scale (a numerical scaling tool for surveys), with 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree. The in-person interviews further elaborated on survey answers and focused on the emotional response elicited by the design features highlighted in the surveys. The interview process allowed for deeper insight into patient experience and an opportunity for further communication with medical staff.

The participant surveys and interviews validated the personal observations and helped standardize data across subjects. The interactions facilitated the process of drawing associations between architectural design and human experience by juxtaposing engineering concepts of space and size with personal experiences of comfort and efficiency. It also helped in evaluating the comparisons of healthcare environments based on their geographic location and socio-cultural fabric.

Data was collected in a secure space without recording any personal identifying information. It was stored safely in a password-protected computer, accessible only to research personnel. Qualitative analysis was

conducted by coding the interviews and identifying and recording common patterns and themes. Quantitative data analysis was completed using the simple statistical tools of calculating means and tests of significance. A total of 24 medical staff members and patients participated in the surveys and interviews at seven medical sites within Bay Area and New Delhi. There were 11 patients and 13 medical staff. 14 participants were from the Bay Area and 10 from New Delhi.

## Results

*Quantitative:* Surveys were analyzed by location (Bay Area/New Delhi) and participant type (patient/staff). This led to the creation of four groups: Bay Area patients, Bay Area staff, New Delhi patients, and New Delhi staff.

*Table 1* summarizes results for the first two survey questions, asking participants which rooms they find most and least welcoming. Bay Area staff and patients both rated the atrium as most welcoming (*as shown in Image 2*).



IMAGE 2. Bay Area staff and patients chose the atrium as the most welcoming part of a clinic.

Bay Area patients found exam rooms least welcoming, while Bay Area staff found waiting rooms least welcoming. For New Delhi participants, the results were inverted. Patients rated exam rooms most welcoming and waiting rooms least welcoming; staff rated waiting rooms most welcoming and restrooms least welcoming.

Location	Participant type	Most welcoming	Least welcoming
Bay Area	Patient (n=7)	Atrium (3)	Exam room (4)
	Staff (n=7)	Atrium (6)	Waiting room (4)
New Delhi	Patient (n=4)	Exam room (2)	Waiting room (2)
	Staff (n=6)	Waiting room (3)	Restrooms (2)

TABLE 1. The most and least welcoming rooms, rated by location and participant type.

For the following seven survey questions, participants rated design features (navigation, lighting, furniture, walls, and openness) and experience features (care and comfort) in their healthcare environment (design score range = 8-20, experience score range = 2-8). To simplify calculations, participant ratings for design and experience scores were aggregated by location/participant type. In each participant group, mean scores for the design and experience features were calculated by adding all the ratings from individual participants in the group and dividing by the number of participants in the group. *Table 2* summarizes mean scores for survey questions regarding design and experience features in the healthcare environments, based on location and participant type. Mean scores helped identify the most successful design features for each participant group (higher score indicated more appreciation for the design). Comparing design and experience total scores provided insight into location-specific culture and valued features.

pat/staff	Design features					Experience features			
	navigation	lighting	furniture	walls	open	DESIGN TOTAL score	comfort	care	CARE TOTAL score
BA patient (n=7)	3.29	3.57	3.14	3.29	3.29	16.58	3.71	3.71	7.42
BA staff (n=7)	2.71	2.86	2.71	3.00	2.86	14.14	3.00	2.86	5.86
ND patient (n=4)	2.75	3.25	3.00	3.25	2.25	14.50	3.50	3.25	6.75
ND staff (n=6)	3.00	3.00	3.17	3.00	3.00	15.17	3.17	3.50	6.67

TABLE 2. Design and experience ratings by location and participants.

Bay Area patients had the highest total design and experience scores (design = 16.58, experience = 7.42). Bay Area staff had the lowest design and experience scores (design = 14.14, experience = 5.86). In general, higher design scores were associated with higher levels of care and comfort. Navigation, openness, and lighting featured as strong indicators of good design, since they had the highest ratings. High design scores reflected greater experience satisfaction, as represented by Bay Area patients, who had the highest design and experience scores. Lower design scores were indicative of lesser satisfaction with experience, as seen in the Bay Area staff group.

To assess overall satisfaction levels, design and experience total scores were added to obtain a combined score for each of the four participant groups. *Figure 1* depicts the combined design and experience scores for each group. Combined scores helped to distinguish which participant group was most satisfied with both design and experience features in their healthcare environments. Overall, Bay Area patients were most satisfied, while Bay Area staff were least satisfied. New Delhi staff was the second-most satisfied participant group, while New Delhi patients were third.

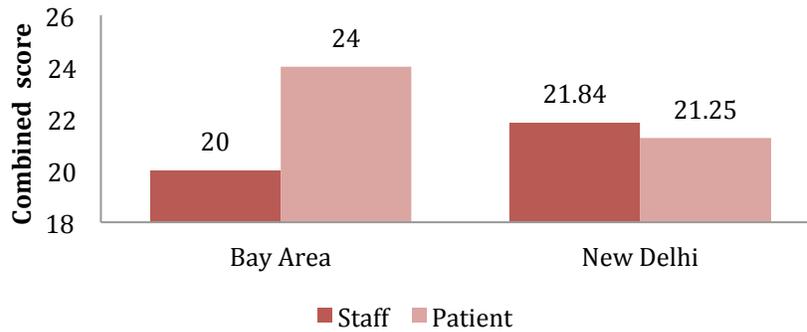


FIGURE 1. Combined scores for each participant group.

*Qualitative:* Patient and staff interviews in both locations revealed that overall, the most valued design features were easy navigation and well-planned layouts. While staff highly valued intuitive and efficient architectural design, for many patients, the importance of feeling care and comfort exceeded the need for aesthetic healthcare environments.

*Patients:* Patients in the Bay Area highlighted the presence of paintings and sculptures as appealing (as shown in Image 3). A Bay Area patient said of the Palo Alto Medical Foundation, “It’s very well lit and I love all the paintings and sculptures. It sometimes doesn’t feel like a place to go to

because you're ill. I really like the doctors here. I feel well-cared for.” Although both patient groups placed a high value on patient care, New Delhi patients valued the quality of care over and above the architectural design of the clinic. A New Delhi patient at Kumar's Clinic said, “It is good to come here because the village clinic is smaller, but speaking with the doctor is the best.”



IMAGE 3. Patients liked having artwork and sculptures in the waiting room and lobby.

*Staff:* Bay Area staff had a preference for large windows with views of nature. One Bay Area staff member at Morrill's Clinic said, “The large window overlooking the trees is my favorite part of the clinic,” (see Image 5) while another at Fair Oaks Clinic said, “I love the access of having a window... I just like having a natural light setting. Sometimes I get headaches and migraines so I tend to shut the lights, and if I can have natural light come in then it's perfect for me.” New Delhi staff stated that large waiting rooms were most valuable due to the large number of patients and often, their accompanying families.



IMAGE 4. Most hospital staff highly valued windows enabling natural lighting.

Both Bay Area and New Delhi staff claimed that clinic space was either insufficient or poorly planned. At Fortis Hospital in New Delhi, many international patients come with families; a Fortis physician explained, “The lobby is an open area and it gives a feel of openness, but not a hospital kind of feeling. There’s a wastage of space... examination rooms and waiting rooms do not cater for the number of patients we have. Like in my department, if I have 40-50 patients, there’s no place for them to sit... waiting rooms are [overcrowded] because you don’t know how many [to expect]... a person coming from South Africa or Saudi Arabia or Russia will not come alone. The whole family will come with him.” A physician at Palo Alto Medical Foundation also felt that an expansion of the facility, or at least reorganization of space, was needed for more efficient functioning. *Image 5* is an example of a well-designed waiting room in the Bay Area.



IMAGE 5. A spacious, well-lit waiting room with adequate seating and comfortable furniture.

### Discussion

The surveys and interviews demonstrated that participants feel more satisfied with the care provided at clinics and hospitals with better interior design, layout, and organization. This was especially evident in the results from Bay Area patients. Bay Area clinics are designed to be patient-centric, and this was reflected in the results, as Bay Area patients had the highest ratings overall for design and experience features. In comparison, Bay Area staff had the lowest design ratings amongst all participant groups, and also reported lower levels of care and comfort, suggesting that even though the Bay Area healthcare environments are aesthetically

beautiful, they may not be designed for optimal functioning. In New Delhi, the difference between patient and staff perceptions was less apparent. New Delhi patients placed more emphasis and value on the interaction with the healthcare provider, rather than the interior design of the health care environment. In contrast to Bay Area staff, New Delhi staff did not place as much importance on design features in facilitating healthcare delivery.

The discrepancy in the perceived need and impact of interior design on healthcare delivery can be analyzed within the context of locational, socio-economic, and cultural factors. Many of the New Delhi patients belong to a poorer socio-economic level than Bay Area patients; they are not accustomed to substantive customer care in small towns and villages, and are thus satisfied with the medical care they receive in metropolitan hospitals and even smaller clinics, simply because they perceive the treatment as better than what they would have otherwise received. In addition to the financial disparity, a difference in education levels may also influence the level of impact patients and staff members attribute to design on the delivery of care.

A limitation in this study was the small sample size. The relationship between interior design and healthcare delivery can be better understood by generalizing the findings beyond the case studies analyzed in this study. Expanding and diversifying the sample of healthcare environments on a global scale may provide a more comprehensive perspective on the role of confounding factors, such as location, socio-economic level, and culture, in associating design and healthcare delivery. Further research studies can include involvement of more participants at each medical site, inclusion of larger healthcare facilities, or evaluation of clinics in other geographic locations. Further ethnographic research on socio-cultural issues affecting perceptions might provide additional insight as well. This study primarily evaluated qualitative data; inclusion of quantitative data and measurable outcomes, such as health outcomes, length of patient stay, and work efficiency, may strengthen this area of research.

## Conclusion

This study evaluates the perceptions of patients and medical staff on the interior design, layout and organization of healthcare facilities of varying sizes in Bay Area and New Delhi. The results from surveys and interviews affirmed the hypothesis that design features can affect patients' perceived level of care and comfort and staff's perceived workflow efficiency and ability to provide improved patient care. For staff, intuitive layout and organization improved their workflow, while for patients, aesthetic interiors gave the perception of feeling more comfortable.

An interior design and layout that caters to the needs of the medical staff improves their ability to deliver a higher level of healthcare, while design that caters to the needs of patients enhances their treatment experience. Designing a healthcare environment thus requires striking the

right balance between aesthetics and function, as it can affect both the perceived and actual quality of service. To optimize efficiency and satisfaction level for all users, the design of healthcare environments should take into account geographic location, social-economic level of patients, and cultural aspects such as patient-doctor relationship. Clinic designs should allow for maximum efficiency for staff in performing their tasks, while acknowledging and integrating the needs of the patients.

#### Acknowledgements

This research was made possible by a generous grant awarded by the Chappell Lougee Scholarship. My mentors for this project came from the fields of both architecture and medicine. Professor John Barton, the Director of the Architectural Design program at Stanford and my major advisor, played a vital role in defining the scope and goals of the project. Dr. Sakti Srivastava, an associate professor at the Stanford Medical School, served as a field contact in New Delhi. He put me in contact with several physicians at both Bay Area and New Delhi medical sites, and also helped in formulating the study design. Christina Mesa, previously the Chappell Lougee Program Director, guided me through the application process for the grant proposal.

## References

- Brown, K. K., and D. Gallant. (2006). Impacting patient outcomes through design: Acuity adaptable care/universal room design. *Critical Care Nursing Quarterly*, 29(4) 326-341. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/17063100>
- Guidelines in the planning and design of a hospital and other health facilities. (2004, Nov). Retrieved from [http://www.doh.gov.ph/sites/default/files/publications/planning\\_and\\_design\\_hospitals\\_other\\_facilities.pdf](http://www.doh.gov.ph/sites/default/files/publications/planning_and_design_hospitals_other_facilities.pdf)
- Karlin, Bradley E., and Robert A. Zeiss. (2006). Best practices: Environmental and therapeutic issues in psychiatric hospital design: toward best practices. *Psychiatric Services*, 57(10), 1376-1378. doi: 10.1176/ps.2006.57.10.1376
- Lambert, V., J. Coad, P. Hicks, and M. Glacken. (2013). Young children's perspectives of ideal physical design features for hospital-built environments. *Journal of Child Healthcare*, 1-15. doi: 10.1177/1367493512473852
- Mroczek, J., G. Mikitarian, E. K. Vieira, and T. Rotarius. (2005). Hospital design and staff perceptions: An exploratory analysis. *The Health Care Manager*, 24(3), 233-244. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/16131934>
- Planning, Design, and Construction of Health Care Facilities. (2009). 2nd ed. Retrieved from [http://www.jcrinc.com/assets/1/14/PDC09\\_Sample\\_Pages.pdf](http://www.jcrinc.com/assets/1/14/PDC09_Sample_Pages.pdf)
- Reiling, J. G., and B. L. Knutzen. (2004). Enhancing the traditional hospital design process: A focus on patient safety. *Joint Commission Journal on Quality and Safety*, 30(3), 115-124. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/150320688>
- Rules and regulations for construction rules for health care facilities. (2011, November, 16). Retrieved from [https://health.wyo.gov/wp-content/uploads/2016/06/HLS-109-Guidelines\\_to\\_Ch\\_3\\_Rule.pdf](https://health.wyo.gov/wp-content/uploads/2016/06/HLS-109-Guidelines_to_Ch_3_Rule.pdf)
- Ulrich, R. (1984). View through a window may influence recovery. *Science*, 224(4647). 420-421. doi: 10.1126/science.6143402